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FASTENERLESS MOUNTING BRACKET FOR HEAT EXCHANGERS

TECHNICAL FIELD

[0001] This invention relates to automotive air conditioning in general, and specifically to a novel design for automotive heat exchanger mounting and support brackets.

BACKGROUND OF THE INVENTION

[0002] Automotive heat exchangers comprise a basic central core comprised of regularly spaced tubes and intermediate corrugated air fins, framed on four sides by a pair of parallel header tanks. Although this invention is intended for any similar heat exchanger it has particular utility with a condenser. Typically, the condenser header tanks are vertically oriented, and the tubes horizontally oriented. Some means is necessary to mount to condenser physically to the vehicle, generally in front of the engine-cooling radiator. The condenser may be mounted directly to the vehicle frame, or indirectly mounted to the vehicle by mounting to the radiator. Whether it's directly or indirectly mounted to the vehicle, the condenser generally requires several brackets, securely fixed to its core structure, which can in turn receive threaded bolts or other fasteners to allow the condenser to be fixed in place.

[0003] The alternatives for providing mounting brackets on the condenser include extruding the header tank with integral rails, or attaching separate brackets. Integral rails are heavy, being the full length of the extruded tank, an example of which may be seen in U.S. Pat. No. 5,671,803. Much of the weight of an extruded header tank rail can be processed away in a post extrusion manufacturing

step, leaving only a discrete flange, but the extra step adds expense. Most separate mounting brackets are metal pieces that are somehow fixed to the header tank before the brazing operation and then brazed on solidly later. Numerous examples may be seen in the prior art, as in U.S. Pat. No. 5,205,349. The addition of discrete, localized metal masses to an otherwise regular metal part is undesirable in that it can introduce irregularities in the braze temperature profile, as well as interfere with the smooth stacking and running of parts on the conveyor belt. Separate mounting brackets may also be attached after the brazing operation, as shown in U.S. Pat. No. 5,535,819, where metal brackets are bolted to the condenser reinforcement after the braze operation. One or more fasteners are needed for each of four brackets, which involves considerably more labor than simply snapping a bracket to a header tank prior to the braze operation. One recent U.S. Pat. No. 6,202,737, shows a condenser attached to a radiator tank with a bracket that is described as being "nested" on top of the condenser tank before being snapped to the radiator tank. It is unclear what "nesting" means, and unclear what material is used in the bracket. Yet another development is disclosed in U.S. Patent 6,513,579, wherein a plastic mounting bracket that is press fit onto each corner of the condenser addresses some of these problems. These plastic brackets are simple and light molded pieces that are attached to the corners of condenser core entirely post braze, in a simple press fit operation that needs no separate fasteners. Each bracket has a cap that fits closely over the end of header tank and an integral channel on the side that snap fits over the core reinforcement, with no additional fasteners needed. Once installed to the condenser core, the plastic brackets gain solid twisting resistance from both sides of the condenser corner, as well as solid removal resistance from the close, snap fit. There remains a need for simple and effective mounting arrangements for heat exchangers that avoid the use of fasteners and

accommodate brazing and processing of the heat exchanger core.

SUMMARY OF THE INVENTION AND ADVANTAGES

[0004] The subject invention provides a unique mounting system for a heat exchanger assembly comprising a heat exchanger core having opposite faces surrounded by ends and sides with a first header manifold disposed at one side of the heat exchanger core and a second header manifold **30** in parallel relationship to the first header manifold and disposed along the other side of the heat exchanger core. Each of said manifolds has a constant cross section along the length thereof and at least one projection disposed along the first manifold. A plastic bracket grips the first manifold and includes at least one recess disposed about the projection for preventing the bracket from moving along the manifold.

[0005] The subject invention allows the use of a plastic bracket in combination with a header manifold of simple cross section without rails or extensions whereby the manifold may be extruded, made in a tube mill, or the like, in a continuous and constant cross section. The bracket is attached without the use of any fasteners.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Other advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

[0007] Figure 1 is a perspective view of a first embodiment of the invention;

[0008] Figure 2 is a cross sectional view taken along line 2-2 of Figure 1;

[0009] Figure 3 is a cross sectional view taken along line 3-3 of Figure 1;

[0010] Figure 4 is a close-up view of figure 3;

[0011] Figure 5 is perspective view of the heat exchanger core without the bracket attached thereto;

[0012] Figure 6 is perspective view of the bracket only;

[0013] Figure 7 is a frontal view of a heat exchanger assembly incorporating a second embodiment of the bracket;

[0014] Figure 8 is perspective view of the second embodiment of the bracket shown in the closed position; and

[0015] Figure 9 is perspective view of the second embodiment of the bracket shown in the open position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0016] Referring to the drawings wherein like numerals indicate like or corresponding parts throughout the several views, an automotive heat exchanger or condenser assembly is generally indicated at **20**. The heat exchanger assembly **20** comprises a heat exchanger core **22** having opposite faces surrounded by ends **24** and sides **26**, the core **22** being of the well known type including tubes and fins. A first header manifold **28** is disposed at one side **26** of the heat exchanger core **22** and a second header manifold **30** is in parallel relationship to the first header manifold **28** and is disposed along the other side of the heat exchanger core **22**. As is well known in the art, the core **22** includes tubes for conveying fluid between the manifolds **28**

and **30, 28** and **30** and fins on the tubes for effective heat transfer. Each of the manifolds **28** and **30** has a constant cross section along the length thereof. More specifically, the cross section is circuitous or endless, as in a circle or oval. Each manifold **28** and **30** has a transverse dimension (A) perpendicular to the faces of the heat exchanger core **22** which is larger than the distance (B) between the faces of the core **22**.

[0017] A plurality of projections **32** are disposed along each of the manifolds **28** and **30**. The projections **32** take the form of beads formed in the pipe defining the manifolds **28** and **30** or collars, rings or separator ears added prior to brazing. Alternatively, the projections can project inwardly to define grooves or valleys. In yet another alternative, locating ears as part of the separator could be used.

[0018] A plastic bracket, generally indicated at **34** in Figures 1-6 and at **134** in Figures 7-9, is in gripping engagement with each of the first manifold **28** and the second manifold **30**. The bracket **34** and **134** includes a plurality of recesses **36** disposed about the projection **32** for preventing the bracket **34** and **134** from moving along the associated manifold **28** or **30**. The brackets **34** or **134** on opposite sides of the core **22** are mirror images of one another for oppositely gripping the first **28** and second **30** manifolds. Alternatively, the two halves could be identical with the two halves oriented 180° relative to one another. The brackets are integrally molded or one piece plastic components. The design shown in Figures 8 & 9 could also be in two pieces instead of being connected by a living hinge.

[0019] Each bracket **34** and **134** includes a pocket **38** surrounding the associated manifold **28** or **30** and a pair of spaced flanges **40** extending from the pocket **38** to engage the faces of the heat exchanger core **22**. The cross section of each manifold **28** and **30** is round and the pocket **38** is complementary to that roundness

shape. The flanges **40** have inside surfaces engaging the faces of the heat exchanger core **22** that are closer together at the distance (B) than the transverse dimension or diameter (A) of the manifolds **28** and **30** for retaining the bracket **34** and **134** on the heat exchanger core **22** and to prevent rotation of the bracket, about the axis of the manifold. In other words, the flanges **40** are closer together (B) than the inside diameter (A) of the pocket **38** in the bracket **34.** In the case where the projections **32** extend radially inwardly to define a groove instead of radially outwardly, the recesses **36** would be an inwardly extending duration or rib disposed in the groove.

[0020] As will be appreciated the projections **32**, whether they be male or female (out or in), define irregulorities and the recesses **36**, whether they be male or female, define deviations complimentary to one another for locking engagement to prevent longitudinal movement of the bracket **34** along the manifold. Of course, the manifolds **28** and **30** could have other than a circular cross-section.

[0021] A support tab **42** extends from the pocket **38** in the opposite direction from the flanges **40** for mounting the bracket **28** or **30** to a support structure of a vehicle.

[0022] The bracket **34** of Figures 1-6 differs from the bracket **134** of Figures 6-9 in that the first embodiment **34** snaps onto the manifold **28** or **30** and is held in place by the frictional clamping forces of the stationary flanges **40** thereof whereas the flanges **40** of the second embodiment are hinged by a living hinge **44** to rotate into clamping engagement with the manifold **28** or **30**. As alluded to above, the living hinge could be replaced by a hinge between separate parts, even identical parts. To accommodate the placement of the bracket **34** onto the manifold **28** or **30**, the recesses **36** include extensions **46** that extend into the flanges **40** for receiving the projections **32** as the flanges **40** of the bracket **34** separate in sliding over the manifold

28 or **30**. In addition, the distal ends of the flanges **40** include outwardly extending flares **48** for facilitating movement of the manifold **28** or **30** into the pocket **38**. The first bracket **34** also includes cutouts **50** along the flanges **40**. In order to facilitate or simplify molding, the cutouts being staggered along the flanges so that a cutout does not face another cutout, i.e., each cutout is disposed opposite to a flange **40**.

[0023] As alluded to above, the second embodiment of the bracket shown at **134** in Figures 7-9 includes a living hinge **44** to move the flanges **40** thereof in a circular path about the axis of the hinge **44** and into clamping engagement with the opposite faces of the core **22** with the pocket **38** thereof engaging the associated manifold **28** or **30**. In order to hold the bracket **134** in the clamping position, a plurality of snap posts **52** extending for one flange **40** have hooked ends that snap into latch holes **54** in the other flange **40**. The posts extend through guides **56** in the clamped or locked position, as shown in Figure 8. The posts **52** extend through openings in the core **22**.

[0024] Obviously, many modifications and variations of the present invention are possible in light of the above teachings. The invention may be practiced otherwise than as specifically described within the scope of the appended claims.